COURSE TITLE: Foundations of Energy

UNIT TITLE: Nonrenewable Energy–Natural Gas

SECTION 1: General Information and Overview

Grade Level: 9-12

Suggested Number of Lessons: 7 -8

Suggested Time to Complete Unit: 2 weeks

Unit Overview: This unit provides an overview of the energy source natural gas and how it is impacted by geology, methods of extraction, storage, transportation, combustion.

SECTION 2: Essential Questions

1.	Why is natural gas such an environmentally friendly fossil fuel?
2.	What role does natural gas have in the energy portfolio for our state?
3.	How does the infrastructure in storage/transportation support the use of natural gas as an energy source?

SECTION 3: Major Focus

Technical Content CTE Program of Studies	Learner Activities (Enabling Knowledge and Skills/Processes)	Core Content For Assessment	Academic Expectations
Construction Technology KOSSA Standard AD-002: Demonstrate the ability to learn new processes and steps. **6.2--**Assess the impact of various current and new technologies on the economy.	**Research and discuss** the process for locating and mapping proposed drilling sites for natural gas wells. Using the provided PDF files in the *Natural gas unit*, **research** current and new policies in the energy industry for: • understandings of current energy trends in the area of natural gas • the impact on the nation's energy portfolio • the economy at the state and national levels.	**SC-HS-1.1.8** Students will: • explain the importance of chemical reactions in a real-world context; • justify conclusions using evidence/data from chemical reactions Chemical reactions (e.g., acids and bases, oxidation, combustion of fuels, rusting, tarnishing) occur all around us in every cell in our bodies. These reactions may release or absorb energy. **DOK 3**	**2.1** Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

6.2--Map the major sources of energy used in Kentucky.	**View** map of Kentucky to locate counties of major natural gas producing areas. **Participate** in a class discussion on the geological differences of these locations, **summarize** the findings and **report** out to the class.		
Construction Technology KOSSA Standard AD-003: Implement new processes given oral instructions. **2.1-2.3--**Engaging in meaningful hands-on, minds-on conceptual based activities in the area of energy technologies.	Using the resource files on the *Foundations of Energy* CD, **develop** and **display** an exhibit on the new or emerging technologies researched regarding natural gas energy. **Identify** chemical properties and their role in the production of electricity. **Develop and participate** in the activity, *Energy source expo.* **Use** the scoring rubric to **assess** the display.	**SC-HS-4.6.7** Students will: • explain real world applications of energy using information/data; • evaluate explanations of mechanical systems using current scientific knowledge about energy. The universe become less orderly and less organized over time. Thus the overall effect is that the energy is spread out uniformly. For example, in the operation of mechanical systems, the useful energy output is always less than the energy input; the difference appears as heat. **DOK 2**	**2.2** Students identify, analyze and use patterns such as cycles and trends to understand past and present events and predict possible future events.
Construction Technology KOSSA Standard EA-005: Display initiative. **5.4--**Students will investigate with teacher guidance the role of technology in the future.	Using the resource CD and the activity E*nergy Enigma* • **compare** and **contrast** uses of natural gas • impacts of natural gas on the environment • **identify** differences between other non-renewable sources of energy found in the US. **Review** documents found on the DOE website, www.doe.gov, regarding	**SC-HS-4.61** Students will: • explain the relationships and connections between matter, energy, living systems and the physical environment; • give examples of conservation of matter and energy. As matter and energy flow through different organizational levels (e.g., cells, organs, organisms,	**2.4** Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

6.2--Map the major sources of energy in Kentucky.	energy and electrical production from natural gas. **Review** articles on public perspectives on use and availability of natural gas. **Prepare** a graph to report and interpret those findings from this research. **Identify** and **define** the following key terms: • peak load • base load • IGCC • CGC • CFM • enigma **Record** this information in class notebook.	communities) and between living systems and the physical environment, chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy into the environment as heat. Matter and energy are conserved in each change. **DOK 3**	
Construction Technology KOSSA Standard AC-002: Students will identify methods of planning that will save costs on time and materials.	Using the resource maps from the NEED resource file, **listen** to a teacher presentation on the topic of environmental impact of natural gas drilling, uses and transportation. F**ormulate, develop** and **defend** an opinion on a topic of your choice and present your stand in the form of a term paper or classroom debate; **identify** and **include** the advantages and disadvantages of your opinion.	**SC-08-4.6.2** Students will: • describe or explain energy transfer and energy conservation; • evaluate alternative solutions to energy problems. Energy can be transferred in many ways, but it can neither be created nor destroyed. **DOK 3**	**2.6** Students understand how living and nonliving things change over time and the factors that influence the changes.

SECTION 4: Culminating Project with Scoring Guide

Create a consumer's guide on the advantages and availability of natural gas supply in Kentucky. Include the following as a minimal: map of the state with natural gas reserves, chemical structure (include the combustion of natural gas--the environmental advantages) and the possible uses for natural gas as a fuel for transportation and electricity production.

SCORING GUIDE:

CATEGORY	4	3	2	1
CONTENT	EXTENSIVE-COMPLETE WITH MAP OF RESERVES, CHEMICAL STRUCTURE WITH COMBUSTION , AND POSSIBLE USES	GOOD- EXPLANANTION WITH MAP OF RESERVES, STRUCTURE, AND POSSIBLE USES	BASIC – EXPLANANTION, WITH MAP OF RESERVES, AND POSSIBLE USES	LIMITED- EXPLANATION WITH MAP OF RESERVES AND SOME USES
RESEARCH	EXTENSIVE- DETAILED INFORMATION OF THE NATURAL GAS RESERVES AND USES FOR NATURAL GAS IN KENTUCKY	APPROPRIATE- DETAILED INFORMATION OF THE NATURAL GAS RESERVES AND USES FOR NATURAL GAS IN KENTUCKY	BASIC- INFORMATION OF NATURAL GAS RESERVES AND USES	LIMITED – INFORMATION OF NATURAL GAS RESERVES AND USES
PRESENTATION	EXCELLENT- INCLUDES PICTURES, DIAGRAMS, CHARTS, AND DETAILED INFORMATION	GOOD – INCLUDES SOME PICTURES, DIAGRAMS, CHARTS AND DETAILED INFORMATION	BASIC – INCLUDES A FEW PICTURES, DIAGRAMS, OR CHARTS WITH FEW DETAILS	LIMITED- NO PICTURES, DIAGRAHMS, CHARTS AND LIMITED DETAILS

SECTION 5: Assessment and Enabling Skills and Processes

Assessment:	Participate in a debate and include the use of technology graphics in presenting a 10-15 slide power point as a component of the debate. Students develop a display exhibit of natural gas. Class participation in map finding of Kentucky's natural gas supply. End-of-unit exam.

SECTION 6: Support Materials (i.e., Resources, Technology, and Equipment)

A. Resources	NEED Secondary INFO book, geological maps, Enigma file, FF2P kit
B. Technology	Classroom equipment
C. Websites (samples of many available)	US Department of Energy, www.doe.gov US Energy Information Administration, www.eia.gov www.ky.gov
D. Equipment	Computer with desktop publishing